SUMMARY

Seminar on
Long-Term Ground Water Monitoring Optimization

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LTMO

Take-Home Messages

We Want You To Leave With Key Concepts

- There are Substantial Benefits to LTMO
  - Verify Remedy Effectiveness
  - Reduce Cost
- Generally Two Approaches
  - Qualitative: Rely on Knowledge and Judgment
  - Quantitative: Use Statistical and Simulation Tools
  - Qualitative Assessment Needed for Quantitative Analyses
  - Assess Sampling Frequency, Locations as well as Sampling and Analytical Methods, Data Management

Take-Home Messages, Continued

- Need to Know:
  - LTM Objectives
  - Hydrogeology
  - Data Comparability and Quality
  - Data Availability (Electronic Most Useful)
  - Recent and Future Remedial Actions
  - Stakeholder Concerns
- LTMO Candidate Sites
  - Larger, More Complex, Known Questions = More Benefit
  - Sites Must be Adequately Characterized
  - Minimum Data Requirements for LTMO Method
  - Remediation Status Clear

Take-Home Messages, Continued

- Qualitative Analysis
  - Can Consider Variety of Parameters,Issues
  - Decision Logic Should be Clear, Still Subjective
  - Needed for Review of LTMO Results
- Quantitative Analysis
  - Based on Trends, Weight of Information
  - Less Subjective, Need Expertise
- Various LTMO Methods
  - GTS, MAROS, Parsons Three-Tiered
  - More Detail Tomorrow
  - Mathematical Optimization Methods

Take-Home Messages, Continued

- MAROS
  - Trend Analysis for Sample Frequency Analysis, Based on CES Method
  - Delaunay Triangle Method for Spatial Analysis
  - Plume Moment Analysis to Assess Stability
  - Access-Based
  - Two-Dimensional Analysis, Need Time History

Take-Home Messages, Continued

- Parsons Three-Tiered Approach
  - Combination of Qualitative/Quantitative
  - Qualitative Analysis Decision Logic
  - Quantitative Assessment of Sampling Frequency Based on Trend Analysis
  - Quantitative Assessment of Sample Locations Based on Geostatistical Analysis
  - Need Minimum Time History and 15-20 Wells for Quantitative Assessment

Take-Home Messages, Continued

- Geostatistical Temporal-Spatial (GTS) Algorithm
  - Sample Frequency Optimization Via Temporal Geostatistics and Iterative Thinning
  - Sample Network Optimization Via Locally Weighted Quadratic Regression
  - Need 8 Samples/Well and >20 Wells
- Developing LTMO Methods
  - Mathematical Optimization Methods – Genetic Algorithms, Kalman Filtering
  - Machine Learning – Neural Networks
  - Combine with Simulation Tools
  - Multi-Objective Optimization – Trade Costs for Certainty
  - Need for Good Data

Take-Home Messages, Continued

- As a Reviewer of LTMO Studies,
  - Need to Assess Data
  - Need to Assess Analysts
  - Need to Understand Site Contaminants and Hydrogeology
- In Review
  - Need to Perform a Bit of Qualitative Analysis
  - Compare Recommendations Against
    - Objectives
    - Regulatory Requirements
  - Assess Reality of Costs, Logistics for Implementation

Take-Home Messages, Continued

- Flexibility in Site Documents Facilitates LTMO Implementation
  - Flexibility in Sampling and Analysis Plans
  - Flexibility in Decision Documents
  - Development of a Site Exit Strategy that Includes Periodic LTMO (Method, Logic to be Determined and Documented)

Previous Results

- Demonstration Projects
- Significant Improvements to LTM Programs
  - Fill Data Gaps
  - Potential Cost Savings
- Tools, Approaches Demonstrated

Current OSRTI LTMO Evaluations

- OSRTI in conjunction with the Army Corps. and Parsons is in the process of conducting two LTMO evaluation for fund lead sites.

- Look for reports out this fall.

LTMO

For More Information…

- Hands-On Training Tomorrow
- LTMO Roadmap!
- Other Guidance
  - Clu-In
  - FRTR
  - Case Studies
  - Other Web Sites (See List)
- Contact Instructors